

1

SEQUENCE LISTING

<110> BASF Aktiengesellschaft

<120> D6-acetylenase and D6-desaturase from Ceratodon
purpureus

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<150> 19925718.3

<151> 1999-06-07

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<170> PatentIn Vers. 2.0

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<211> 2040

<212> DNA

<213> Ceratodon purpureus

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<221> CDS

<222> (176)..(1627)

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tcagggtcga tcagggttatt ctgaaaaagg ctgcgtctgt gagcagtttg caaaa atg 178
Met

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gcc ctc gtt acc gac ttt ctg aac ttt ctg ggc acg aca tgg agc aag 226

Ala Leu Val Thr Asp Phe Leu Asn Phe Leu Gly Thr Thr Trp Ser Lys

5

10

15

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Tyr Ser Val Tyr Thr His Ser Tyr Ala Gly Asn Tyr Gly Pro Thr Leu

20

25

30

aag cac gcc aaa aag gtt tct gct caa ggt aaa act gcg gga cag aca 322

Lys His Ala Lys Lys Val Ser Ala Gln Gly Lys Thr Ala Gly Gln Thr

35

40

45

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Leu Arg Gln Arg Ser Val Gln Asp Lys Lys Pro Gly Thr Tyr Ser Leu

2

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Ala Asp Val Ala Ser His Asp Arg Pro Gly Asp Cys Trp Met Ile Val				
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aaa gag aag gtg tat gat att agc cgt ttt gcg gac gac cac cct gga				466
Lys Glu Lys Val Tyr Asp Ile Ser Arg Phe Ala Asp Asp His Pro Gly				
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ggg acg gta att agc acc tac ttt ggg cgg gat ggc aca gac gtt ttc				514
Gly Thr Val Ile Ser Thr Tyr Phe Gly Arg Asp Gly Thr Asp Val Phe				
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Ala Thr Phe His Pro Pro Ala Ala Trp Lys Gln Leu Asn Asp Tyr Tyr				
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Ile Gly Asp Leu Ala Arg Glu Glu Pro Leu Asp Glu Leu Leu Lys Asp				
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Tyr Arg Asp Met Arg Ala Glu Phe Val Arg Glu Gly Leu Phe Lys Ser				
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tcc aag gcc tgg ttc ctg ctt cag act ctg att aat gca gct ctc ttt				706
Ser Lys Ala Trp Phe Leu Leu Gln Thr Leu Ile Asn Ala Ala Leu Phe				
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Ala Ala Ser Ile Ala Thr Ile Cys Tyr Asp Lys Ser Tyr Trp Ala Ile				
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Val Leu Ser Ala Ser Leu Met Gly Leu Phe Val Gln Gln Cys Gly Trp				
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Leu Ala His Asp Phe Leu His Gln Gln Val Phe Glu Asn Arg Thr Ala				
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aac tcc ttc ttt ggc tat ttg ttc ggc aat tgc gtg ctt ggc ttt agt				898
Asn Ser Phe Phe Gly Tyr Leu Phe Gly Asn Cys Val Leu Gly Phe Ser				
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gta tca tgg tgg agg acg aag cac aac att cat cat act gct ccg aat				946
Val Ser Trp Trp Arg Thr Lys His Asn Ile His His Thr Ala Pro Asn				
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gag tgc gac gaa cag tac aca cct cta gac gaa gac att gat act ctc				994

3

Glu	Cys	Asp	Glu	Gln	Tyr	Thr	Pro	Leu	Asp	Glu	Asp	Ile	Asp	Thr	Leu	
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Pro	Ile	Ile	Ala	Trp	Ser	Lys	Glu	Ile	Leu	Ala	Thr	Val	Glu	Ser	Lys	
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aga	att	ttg	cga	gtg	ctt	caa	tat	cag	cac	tac	atg	att	ctg	cct	cta	1090
Arg	Ile	Leu	Arg	Val	Leu	Gln	Tyr	Gln	His	Tyr	Met	Ile	Leu	Pro	Leu	
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Leu	Phe	Met	Ala	Arg	Tyr	Ser	Trp	Thr	Phe	Gly	Ser	Leu	Leu	Phe	Thr	
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Phe	Asn	Pro	Asp	Leu	Ser	Thr	Thr	Lys	Gly	Leu	Ile	Glu	Lys	Gly	Thr	
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Pro	Gly	Val	Ala	Lys	Pro	Leu	Ala	Trp	Met	Val	Ala	Thr	Glu	Leu	Val	
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gcc	ggt	ttg	ttg	ttg	gga	ttc	gtg	ttt	acg	ttg	agt	cac	aat	gga	aag	1330
Ala	Gly	Leu	Leu	Leu	Gly	Phe	Val	Phe	Thr	Leu	Ser	His	Asn	Gly	Lys	
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gag	gtt	tac	aat	gaa	tcg	aag	gac	ttc	gtg	aga	gcc	cag	gtt	att	acc	1378
Glu	Val	Tyr	Asn	Glu	Ser	Lys	Asp	Phe	Val	Arg	Ala	Gln	Val	Ile	Thr	
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acc	cgt	aac	acc	aag	cga	ggc	tgg	ttc	aac	gat	tgg	ttc	act	ggg	gga	1426
Thr	Arg	Asn	Thr	Lys	Arg	Gly	Trp	Phe	Asn	Asp	Trp	Phe	Thr	Gly	Gly	
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ctc	gac	acc	cag	att	gag	cat	cac	ctg	ttt	cca	aca	atg	ccc	agg	cac	1474
Leu	Asp	Thr	Gln	Ile	Glu	His	His	Leu	Phe	Pro	Thr	Met	Pro	Arg	His	
		420				425						430				
aac	tac	ccc	aag	atc	gca	cct	cag	gtc	gag	gct	ctt	tgc	aag	aag	cac	1522
Asn	Tyr	Pro	Lys	Ile	Ala	Pro	Gln	Val	Glu	Ala	Leu	Cys	Lys	Lys	His	
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ggc	ctc	gag	tac	gat	aat	gtc	tcc	gtc	gtt	ggt	gcc	tct	gtc	gcg	gtt	1570
Gly	Leu	Glu	Tyr	Asp	Asn	Val	Ser	Val	Val	Gly	Ala	Ser	Val	Ala	Val	
450					455					460					465	

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gtg aag gcg ctc aag gaa att gct gat gaa gcg tca att cgg ctt cac 1618
 Val Lys Ala Leu Lys Glu Ile Ala Asp Glu Ala Ser Ile Arg Leu His
 470 475 480

gct cac taa gaaatcgctg aactttgact attcattttt ttgcctggc 1667
 Ala His

tacctcaaat gttcgggagc aggtgcttgg cagtgtgttc aaccggagcg cactgaaaat 1727

gtgcagaatc catttccaga aattaccatt cctagctaaa tcttcttttt accaggtcgg 1787

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aattcgcagt gtttctattc agcgggcata cgtactagtc catatcggcg gttgccgaga 1907

gtttacatta ttagttggca caacgagtag atctagtgtg aatttctatt tccgcatgta 1967

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<213> *Ceratodon purpureus*

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Thr Leu Arg Gln Arg Ser Val Gln Asp Lys Lys Pro Gly Thr Tyr Ser
 50 55 60

Leu Ala Asp Val Ala Ser His Asp Arg Pro Gly Asp Cys Trp Met Ile
 65 70 75 80

Val Lys Glu Lys Val Tyr Asp Ile Ser Arg Phe Ala Asp Asp His Pro
 85 90 95

Gly Gly Thr Val Ile Ser Thr Tyr Phe Gly Arg Asp Gly Thr Asp Val
 100 105 110

Phe Ala Thr Phe His Pro Pro Ala Ala Trp Lys Gln Leu Asn Asp Tyr
 115 120 125

5

Tyr Ile Gly Asp Leu Ala Arg Glu Glu Pro Leu Asp Glu Leu Leu Lys
 130 135 140

Asp Tyr Arg Asp Met Arg Ala Glu Phe Val Arg Glu Gly Leu Phe Lys
 145 150 155 160

Ser Ser Lys Ala Trp Phe Leu Leu Gln Thr Leu Ile Asn Ala Ala Leu
 165 170 175

Phe Ala Ala Ser Ile Ala Thr Ile Cys Tyr Asp Lys Ser Tyr Trp Ala
 180 185 190

Ile Val Leu Ser Ala Ser Leu Met Gly Leu Phe Val Gln Gln Cys Gly
 195 200 205

Trp Leu Ala His Asp Phe Leu His Gln Gln Val Phe Glu Asn Arg Thr
 210 215 220

Ala Asn Ser Phe Phe Gly Tyr Leu Phe Gly Asn Cys Val Leu Gly Phe
 225 230 235 240

Ser Val Ser Trp Trp Arg Thr Lys His Asn Ile His His Thr Ala Pro
 245 250 255

Asn Glu Cys Asp Glu Gln Tyr Thr Pro Leu Asp Glu Asp Ile Asp Thr
 260 265 270

Leu Pro Ile Ile Ala Trp Ser Lys Glu Ile Leu Ala Thr Val Glu Ser
 275 280 285

Lys Arg Ile Leu Arg Val Leu Gln Tyr Gln His Tyr Met Ile Leu Pro
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Leu Leu Phe Met Ala Arg Tyr Ser Trp Thr Phe Gly Ser Leu Leu Phe
 305 310 315 320

Thr Phe Asn Pro Asp Leu Ser Thr Thr Lys Gly Leu Ile Glu Lys Gly
 325 330 335

Thr Val Ala Phe His Tyr Ala Trp Phe Ser Trp Ala Ala Phe His Ile
 340 345 350

Leu Pro Gly Val Ala Lys Pro Leu Ala Trp Met Val Ala Thr Glu Leu
 355 360 365

Val Ala Gly Leu Leu Leu Gly Phe Val Phe Thr Leu Ser His Asn Gly
 370 375 380

Lys Glu Val Tyr Asn Glu Ser Lys Asp Phe Val Arg Ala Gln Val Ile
 385 390 395 400

6

Thr Thr Arg Asn Thr Lys Arg Gly Trp Phe Asn Asp Trp Phe Thr Gly
 405 410 415

Gly Leu Asp Thr Gln Ile Glu His His Leu Phe Pro Thr Met Pro Arg
 420 425 430

His Asn Tyr Pro Lys Ile Ala Pro Gln Val Glu Ala Leu Cys Lys Lys
 435 440 445

His Gly Leu Glu Tyr Asp Asn Val Ser Val Val Gly Ala Ser Val Ala
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Trp Ser Lys Tyr Ser Val Tyr Thr His Ser Tyr Ala Gly Asn Tyr Gly

15

20

25

30

cct act ttg aag cac gcc aaa aag gtt tct gct caa ggt aaa act gcg 147

Pro Thr Leu Lys His Ala Lys Lys Val Ser Ala Gln Gly Lys Thr Ala

35

40

45

gga cag aca ctg aga cag aga tcg gtg cag gac aaa aag cca ggc act 195

Gly Gln Thr Leu Arg Gln Arg Ser Val Gln Asp Lys Lys Pro Gly Thr

50

55

60

tac tct ctg gcc gat gtt gct tct cac gac agg cct gga gac tgc tgg 243

Tyr Ser Leu Ala Asp Val Ala Ser His Asp Arg Pro Gly Asp Cys Trp

65

70

75

atg atc gtc aaa gag aag gtg tat gat att agc cgt ttt gcg gac gac 291

Met Ile Val Lys Glu Lys Val Tyr Asp Ile Ser Arg Phe Ala Asp Asp

7

80	85	90	
cac cct gga ggg acg gta att agc acc tac ttt ggg cgg gat ggc aca			339
His Pro Gly Gly Thr Val Ile Ser Thr Tyr Phe Gly Arg Asp Gly Thr			
95	100	105	110
gac gtt ttc gca aca ttc cat cca cct gcc gca tgg aag caa ctc aat			387
Asp Val Phe Ala Thr Phe His Pro Pro Ala Ala Trp Lys Gln Leu Asn			
	115	120	125
gac tac tac att gga gac ctt gct agg gaa gag ccc ctt gat gaa ttg			435
Asp Tyr Tyr Ile Gly Asp Leu Ala Arg Glu Glu Pro Leu Asp Glu Leu			
	130	135	140
ctt aaa gac tac aga gat atg aga gcc gag ttt gtt aga gaa ggg ctt			483
Leu Lys Asp Tyr Arg Asp Met Arg Ala Glu Phe Val Arg Glu Gly Leu			
	145	150	155
ttc aag agt tcc aag gcc tgg ttc ctg ctt cag act ctg att aat gca			531
Phe Lys Ser Ser Lys Ala Trp Phe Leu Leu Gln Thr Leu Ile Asn Ala			
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gct ctc ttt gct gcg agc att gcg act atc tgt tac gac aag agt tac			579
Ala Leu Phe Ala Ala Ser Ile Ala Thr Ile Cys Tyr Asp Lys Ser Tyr			
175	180	185	190
tgg gct att gtg ctg tca gcc agt ttg atg ggt ctc ttc gtc caa cag			627
Trp Ala Ile Val Leu Ser Ala Ser Leu Met Gly Leu Phe Val Gln Gln			
	195	200	205
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Cys Gly Trp Leu Ala His Asp Phe Leu His Gln Gln Val Phe Glu Asn			
	210	215	220
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Arg Thr Ala Asn Ser Phe Phe Gly Tyr Leu Phe Gly Asn Cys Val Leu			
	225	230	235
ggc ttt agt gta tca tgg tgg agg acg aag cac aac att cat cat act			771
Gly Phe Ser Val Ser Trp Trp Arg Thr Lys His Asn Ile His His Thr			
240	245	250	
gct ccg aat gag tgc gac gaa cag tac aca cct cta gac gaa gac att			819
Ala Pro Asn Glu Cys Asp Glu Gln Tyr Thr Pro Leu Asp Glu Asp Ile			
255	260	265	270
gat act ctc ccc atc att gcc tgg agc aag gaa att ttg gcc acc gtt			867
Asp Thr Leu Pro Ile Ile Ala Trp Ser Lys Glu Ile Leu Ala Thr Val			
	275	280	285
gag agc aag aga att ttg cga gtg ctt caa tat cag cac tac atg att			915

Glu	Ser	Lys	Arg	Ile	Leu	Arg	Val	Leu	Gln	Tyr	Gln	His	Tyr	Met	Ile	
			290					295					300			
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Leu	Pro	Leu	Leu	Phe	Met	Ala	Arg	Tyr	Ser	Trp	Thr	Phe	Gly	Ser	Leu	
		305					310					315				
ctc	ttc	aca	ttc	aat	cct	gat	ttg	agc	acg	acc	aag	gga	ttg	ata	gag	
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His	Ile	Leu	Pro	Gly	Val	Ala	Lys	Pro	Leu	Ala	Trp	Met	Val	Ala	Thr	
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gag	ctt	gtg	gcc	ggt	ttg	ttg	ttg	gga	ttc	gtg	ttt	acg	ttg	agt	cac	
Glu	Leu	Val	Ala	Gly	Leu	Leu	Leu	Gly	Phe	Val	Phe	Thr	Leu	Ser	His	
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415				420					425						430	
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Lys	Lys	His	Gly	Leu	Glu	Tyr	Asp	Asn	Val	Ser	Val	Val	Gly	Ala	Ser	
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Val	Ala	Val	Val	Lys	Ala	Leu	Lys	Glu	Ile	Ala	Asp	Glu	Ala	Ser	Ile	
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Arg	Leu	His	Ala	His												
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Leu Lys His Ala Lys Lys Val Ser Ala Gln Gly Lys Thr Ala Gly Gln
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Thr Leu Arg Gln Arg Ser Val Gln Asp Lys Lys Pro Gly Thr Tyr Ser
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Leu Ala Asp Val Ala Ser His Asp Arg Pro Gly Asp Cys Trp Met Ile
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Val Lys Glu Lys Val Tyr Asp Ile Ser Arg Phe Ala Asp Asp His Pro
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Gly Gly Thr Val Ile Ser Thr Tyr Phe Gly Arg Asp Gly Thr Asp Val
      100              105              110

Phe Ala Thr Phe His Pro Pro Ala Ala Trp Lys Gln Leu Asn Asp Tyr
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Tyr Ile Gly Asp Leu Ala Arg Glu Glu Pro Leu Asp Glu Leu Leu Lys
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Asp Tyr Arg Asp Met Arg Ala Glu Phe Val Arg Glu Gly Leu Phe Lys
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Ser Ser Lys Ala Trp Phe Leu Leu Gln Thr Leu Ile Asn Ala Ala Leu
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Phe Ala Ala Ser Ile Ala Thr Ile Cys Tyr Asp Lys Ser Tyr Trp Ala
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Ile Val Leu Ser Ala Ser Leu Met Gly Leu Phe Val Gln Gln Cys Gly
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Trp Leu Ala His Asp Phe Leu His Gln Gln Val Phe Glu Asn Arg Thr
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Ala Asn Ser Phe Phe Gly Tyr Leu Phe Gly Asn Cys Val Leu Gly Phe
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10

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 260 265 270
 Leu Pro Ile Ile Ala Trp Ser Lys Glu Ile Leu Ala Thr Val Glu Ser
 275 280 285
 Lys Arg Ile Leu Arg Val Leu Gln Tyr Gln His Tyr Met Ile Leu Pro
 290 295 300
 Leu Leu Phe Met Ala Arg Tyr Ser Trp Thr Phe Gly Ser Leu Leu Phe
 305 310 315 320
 Thr Phe Asn Pro Asp Leu Ser Thr Thr Lys Gly Leu Ile Glu Lys Gly
 325 330 335
 Thr Val Ala Phe His Tyr Ala Trp Phe Ser Trp Ala Ala Phe His Ile
 340 345 350
 Leu Pro Gly Val Ala Lys Pro Leu Ala Trp Met Val Ala Thr Glu Leu
 355 360 365
 Val Ala Gly Leu Leu Leu Gly Phe Val Phe Thr Leu Ser His Asn Gly
 370 375 380
 Lys Glu Val Tyr Asn Glu Ser Lys Asp Phe Val Arg Ala Gln Val Ile
 385 390 395 400
 Thr Thr Arg Asn Thr Lys Arg Gly Trp Phe Asn Asp Trp Phe Thr Gly
 405 410 415
 Gly Leu Asp Thr Gln Ile Glu His His Leu Phe Pro Thr Met Pro Arg
 420 425 430
 His Asn Tyr Pro Lys Ile Ala Pro Gln Val Glu Ala Leu Cys Lys Lys
 435 440 445
 His Gly Leu Glu Tyr Asp Asn Val Ser Val Val Gly Ala Ser Val Ala
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Leu	Ala	Thr	Val	Glu	Ser	Lys	Arg	Ile	Leu	Arg	Val	Leu	Gln	Tyr	Gln
			35				40						45		
His	Tyr	Met	Ile	Leu	Pro	Leu	Leu	Phe	Met	Ala	Arg	Tyr	Ser	Trp	Thr
	50					55				60					
Phe	Gly	Ser	Leu	Leu	Phe	Thr	Phe	Asn	Pro	Asp	Leu	Ser	Thr	Thr	Lys
65					70					75					80
Gly	Leu	Ile	Glu	Lys	Gly	Thr	Val	Ala	Phe	His	Tyr	Ala	Trp	Phe	Ser
			85					90					95		
Trp	Ala	Ala	Phe	His	Ile	Leu	Pro	Gly	Val	Ala	Lys	Pro	Leu	Ala	Trp
			100					105					110		
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12

115

120

125

Thr Leu Ser His Asn Gly Lys Glu Val Tyr Asn Glu Ser Lys Asp Phe
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<212> DNA

<213> Ceratodon purpureus

<400> 7

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 catgttgcca gttcttcagt accagcacct attctttttg gttcttttga cgtttgcccg 180
 ggcgagttgg ctattttgga gcgcggcctt cactctcagg cccgagttga cccttggcga 240
 gaagcttttg gagaggggaa cgatggcttt gcactacatt tggtttaata gtgttgcggt 300
 ttatctgctc cccggatgga aaccagttgt atggatgggtg gtcagcgagc tcatgtctgg 360
 tttcctgctg ggatacgtat ttgtactcag tcacaatgga atggaggtgt acaatacgtc 420
 aaaggacttc gtgaatgccc agattgcac gactcgcgac atcaaagcag ggggtgtttaa 480
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<211> 172

<212> PRT

<213> Ceratodon purpureus

<400> 8

Leu His His Ala Ala Pro Asn Glu Cys Asp Gln Lys Tyr Thr Pro Ile
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 Asp Glu Asp Ile Asp Thr Leu Pro Ile Ile Ala Trp Ser Lys Asp Leu
 20 25 30
 Leu Ala Thr Val Glu Ser Lys Thr Met Leu Arg Val Leu Gln Tyr Gln
 35 40 45

13

His Leu Phe Phe Leu Val Leu Leu Thr Phe Ala Arg Ala Ser Trp Leu
 50 55 60

Phe Trp Ser Ala Ala Phe Thr Leu Arg Pro Glu Leu Thr Leu Gly Glu
 65 70 75 80

Lys Leu Leu Glu Arg Gly Thr Met Ala Leu His Tyr Ile Trp Phe Asn
 85 90 95

Ser Val Ala Phe Tyr Leu Leu Pro Gly Trp Lys Pro Val Val Trp Met
 100 105 110

Val Val Ser Glu Leu Met Ser Gly Phe Leu Leu Gly Tyr Val Phe Val
 115 120 125

Leu Ser His Asn Gly Met Glu Val Tyr Asn Thr Ser Lys Asp Phe Val
 130 135 140

Asn Ala Gln Ile Ala Ser Thr Arg Asp Ile Lys Ala Gly Val Phe Asn
 145 150 155 160

Asp Trp Phe Thr Gly Gly Leu Asn Arg Gln Ile Glu
 165 170

<210> 9

<211> 535

<212> DNA

<213> *Ceratodon purpureus*

<400> 9

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gccattcgat ggcgtagcac gctctctgat tgcctaccag cactggacgt tttatccaat 180

aatggctggt gctcgggtga acctctttgc ccaatccctt ctagtactga cctcgaagaa 240

gcatgtgcca gacaggtggc ttgagctcgg tgctatcggg ttcttctacc tgtgggttctt 300

caccctcttg tcgtacctgc ccactgcacc ggagaggctt gctttcgtcc ttgtcagttt 360

tgtagtgaca gggatccagc atgtacagtt ttgcctgaac cacttctcat cgccgggttta 420

tctaggacag ccgaagagca aggcttgggt tgaatctcaa gcacggggca ctctcaatct 480

ctctacaccg gcttacatgg attgggttca cgggggtctt cagttccaga tcgag 535

14

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 <211> 178
 <212> PRT
 <213> Ceratodon purpureus

<400> 10
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 1 5 10 15
 Tyr Ile Pro Leu Phe Ala Val Thr Ser Lys Leu Phe Ser Asn Leu Tyr
 20 25 30
 Ser Tyr Phe Tyr Glu Arg Val Met Pro Phe Asp Gly Val Ala Arg Ser
 35 40 45
 Leu Ile Ala Tyr Gln His Trp Thr Phe Tyr Pro Ile Met Ala Val Ala
 50 55 60
 Arg Val Asn Leu Phe Ala Gln Ser Leu Leu Val Leu Thr Ser Lys Lys
 65 70 75 80
 His Val Pro Asp Arg Trp Leu Glu Leu Gly Ala Ile Gly Phe Phe Tyr
 85 90 95
 Leu Trp Phe Phe Thr Leu Leu Ser Tyr Leu Pro Thr Ala Pro Glu Arg
 100 105 110
 Leu Ala Phe Val Leu Val Ser Phe Ala Val Thr Gly Ile Gln His Val
 115 120 125
 Gln Phe Cys Leu Asn His Phe Ser Ser Pro Val Tyr Leu Gly Gln Pro
 130 135 140
 Lys Ser Lys Ala Trp Val Glu Ser Gln Ala Arg Gly Thr Leu Asn Leu
 145 150 155 160
 Ser Thr Pro Ala Tyr Met Asp Trp Phe His Gly Gly Leu Gln Phe Gln
 165 170 175
 Ile Glu

<210> 11
 <211> 2160
 <212> DNA
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<220>
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15

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ttgtgcatga cgaggtgggt gtaatcttcg ccggcaga atg gtg tcc cag ggc ggc 176

Met Val Ser Gln Gly Gly

1

5

ggg ctc tcg cag ggt tcc att gaa gaa aac att gac gtt gag cac ttg 224

Gly Leu Ser Gln Gly Ser Ile Glu Glu Asn Ile Asp Val Glu His Leu

10

15

20

gca acg atg ccc ctc gtc agt gac ttc cta aat gtc ctg gga acg act 272

Ala Thr Met Pro Leu Val Ser Asp Phe Leu Asn Val Leu Gly Thr Thr

25

30

35

ttg ggc cag tgg agt ctt tcc act aca ttc gct ttc aag agg ctc acg 320

Leu Gly Gln Trp Ser Leu Ser Thr Thr Phe Ala Phe Lys Arg Leu Thr

40

45

50

act aag aaa cac agt tcg gac atc tcg gtg gag gca caa aaa gaa tcg 368

Thr Lys Lys His Ser Ser Asp Ile Ser Val Glu Ala Gln Lys Glu Ser

55

60

65

70

gtt gcg cgg ggg cca gtt gag aat att tct caa tcg gtt gcg cag ccc 416

Val Ala Arg Gly Pro Val Glu Asn Ile Ser Gln Ser Val Ala Gln Pro

75

80

85

atc agg cgg agg tgg gtg cag gat aaa aag ccg gtt act tac agc ctg 464

Ile Arg Arg Arg Trp Val Gln Asp Lys Lys Pro Val Thr Tyr Ser Leu

90

95

100

aag gat gta gct tcg cac gat atg ccc cag gac tgc tgg att ata atc 512

Lys Asp Val Ala Ser His Asp Met Pro Gln Asp Cys Trp Ile Ile Ile

105

110

115

aaa gag aag gtg tat gat gtg agc acc ttc gct gag cag cac cct gga 560

Lys Glu Lys Val Tyr Asp Val Ser Thr Phe Ala Glu Gln His Pro Gly

120

125

130

ggc acg gtt atc aac acc tac ttc gga cga gac gcc aca gat gtt ttc 608

Gly Thr Val Ile Asn Thr Tyr Phe Gly Arg Asp Ala Thr Asp Val Phe

135

140

145

150

tct act ttc cac gca tcc acc tca tgg aag att ctt cag aat ttc tac 656

Ser Thr Phe His Ala Ser Thr Ser Trp Lys Ile Leu Gln Asn Phe Tyr

155

160

165

atc ggg aac ctt gtt agg gag gag ccg act ttg gag ctg ctg aag gag 704

16

Ile	Gly	Asn	Leu	Val	Arg	Glu	Glu	Pro	Thr	Leu	Glu	Leu	Leu	Lys	Glu		
			170					175					180				
tac	aga	gag	ttg	aga	gcc	ctt	ttc	ttg	aga	gaa	cag	ctt	ttc	aag	agt	752	
Tyr	Arg	Glu	Leu	Arg	Ala	Leu	Phe	Leu	Arg	Glu	Gln	Leu	Phe	Lys	Ser		
		185					190					195					
tcc	aaa	tcc	tac	tac	ctt	ttc	aag	act	ctc	ata	aat	gtt	tcc	att	gtt	800	
Ser	Lys	Ser	Tyr	Tyr	Leu	Phe	Lys	Thr	Leu	Ile	Asn	Val	Ser	Ile	Val		
	200					205					210						
gcc	aca	agc	att	gcg	ata	atc	agt	ctg	tac	aag	tct	tac	cgg	gcg	gtt	848	
Ala	Thr	Ser	Ile	Ala	Ile	Ile	Ser	Leu	Tyr	Lys	Ser	Tyr	Arg	Ala	Val		
215					220					225					230		
ctg	tta	tca	gcc	agt	ttg	atg	ggc	ttg	ttt	att	caa	cag	tgc	gga	tgg	896	
Leu	Leu	Ser	Ala	Ser	Leu	Met	Gly	Leu	Phe	Ile	Gln	Gln	Cys	Gly	Trp		
				235					240					245			
ttg	tct	cac	gat	ttt	cta	cac	cat	cag	gta	ttt	gag	aca	cgc	tgg	ctc	944	
Leu	Ser	His	Asp	Phe	Leu	His	His	Gln	Val	Phe	Glu	Thr	Arg	Trp	Leu		
			250					255					260				
aat	gac	gtt	gtt	ggc	tat	gtg	gtc	ggc	aac	gtt	gtt	ctg	gga	ttc	agt	992	
Asn	Asp	Val	Val	Gly	Tyr	Val	Val	Gly	Asn	Val	Val	Leu	Gly	Phe	Ser		
		265					270					275					
gtc	tcg	tgg	tgg	aag	acc	aag	cac	aac	ctg	cat	cat	gct	gct	ccg	aat	1040	
Val	Ser	Trp	Trp	Lys	Thr	Lys	His	Asn	Leu	His	His	Ala	Ala	Pro	Asn		
	280					285					290						
gaa	tgc	gac	caa	aag	tac	aca	ccg	att	gat	gag	gat	att	gat	act	ctc	1088	
Glu	Cys	Asp	Gln	Lys	Tyr	Thr	Pro	Ile	Asp	Glu	Asp	Ile	Asp	Thr	Leu		
295					300					305					310		
ccc	atc	att	gct	tgg	agt	aaa	gat	ctc	ttg	gcc	act	gtt	gag	agc	aag	1136	
Pro	Ile	Ile	Ala	Trp	Ser	Lys	Asp	Leu	Leu	Ala	Thr	Val	Glu	Ser	Lys		
				315					320					325			
acc	atg	ttg	cga	gtt	ctt	cag	tac	cag	cac	cta	ttc	ttt	ttg	gtt	ctt	1184	
Thr	Met	Leu	Arg	Val	Leu	Gln	Tyr	Gln	His	Leu	Phe	Phe	Leu	Val	Leu		
			330					335					340				
ttg	acg	ttt	gcc	cgg	gcg	agt	tgg	cta	ttt	tgg	agc	gcg	gcc	ttc	act	1232	
Leu	Thr	Phe	Ala	Arg	Ala	Ser	Trp	Leu	Phe	Trp	Ser	Ala	Ala	Phe	Thr		
		345					350					355					
ctc	agg	ccc	gag	ttg	acc	ctt	ggc	gag	aag	ctt	ttg	gag	agg	gga	acg	1280	
Leu	Arg	Pro	Glu	Leu	Thr	Leu	Gly	Glu	Lys	Leu	Leu	Glu	Arg	Gly	Thr		
	360					365						370					

17

atg gct ttg cac tac att tgg ttt aat agt gtt gcg ttt tat ctg ctc 1328
 Met Ala Leu His Tyr Ile Trp Phe Asn Ser Val Ala Phe Tyr Leu Leu
 375 380 385 390

ccc gga tgg aaa cca gtt gta tgg atg gtg gtc agc gag ctc atg tct 1376
 Pro Gly Trp Lys Pro Val Val Trp Met Val Val Ser Glu Leu Met Ser
 395 400 405

ggt ttc ctg ctg gga tac gta ttt gta ctc agt cac aat gga atg gag 1424
 Gly Phe Leu Leu Gly Tyr Val Phe Val Leu Ser His Asn Gly Met Glu
 410 415 420

gtg tac aat acg tca aag gac ttc gtg aat gcc cag att gca tcg act 1472
 Val Tyr Asn Thr Ser Lys Asp Phe Val Asn Ala Gln Ile Ala Ser Thr
 425 430 435

cgc gac atc aaa gca ggg gtg ttt aat gat tgg ttc acc gga ggt ctc 1520
 Arg Asp Ile Lys Ala Gly Val Phe Asn Asp Trp Phe Thr Gly Gly Leu
 440 445 450

aac aga cag att gag cat cat cta ttt cca acg atg ccc agg cac aac 1568
 Asn Arg Gln Ile Glu His His Leu Phe Pro Thr Met Pro Arg His Asn
 455 460 465 470

ctt aat aaa att tct cct cac gtg gag act ttg tgc aag aag cat gga 1616
 Leu Asn Lys Ile Ser Pro His Val Glu Thr Leu Cys Lys Lys His Gly
 475 480 485

ctg gtc tac gaa gac gtg agc atg gct tcg ggc act tac cgg gtt ttg 1664
 Leu Val Tyr Glu Asp Val Ser Met Ala Ser Gly Thr Tyr Arg Val Leu
 490 495 500

aaa aca ctt aag gac gtt gcc gat gct gct tca cac cag cag ctt gct 1712
 Lys Thr Leu Lys Asp Val Ala Asp Ala Ala Ser His Gln Gln Leu Ala
 505 510 515

gcg agt tga ggcacgcag cactcgtcga aacatttttg tctgttatag 1761
 Ala Ser
 520

tgttcatatg tgatcgaggg gaaaagggtcc catgctctga tctattcttc tgtagccaat 1821

atTTTTcaat tgaaaggagg ttcctcactt atcttccatc tatcgttgca catcctgcat 1881

cagagttagc gttggagtaa tgtaagcac ttgtagatta tgcccaccat tgccacattt 1941

ctgttcggtt acaatcgttt gattccatgc taccctcgt gttcatctcg ttgttataag 2001

caagcttgaa aaaacatgct acgagattgg cagacgttgt cttggcagct gtagagggtg 2061

gttcattca ttgtgtagta cagaactctc tcgtccctgt ttctctacat tacttggttac 2121

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2160

<210> 12

<211> 520

<212> PRT

<213> Ceratodon purpureus

<400> 12

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Ile	Asp	Val	Glu	His	Leu	Ala	Thr	Met	Pro	Leu	Val	Ser	Asp	Phe	Leu
			20					25					30		

Asn	Val	Leu	Gly	Thr	Thr	Leu	Gly	Gln	Trp	Ser	Leu	Ser	Thr	Thr	Phe
		35					40					45			

Ala	Phe	Lys	Arg	Leu	Thr	Thr	Lys	Lys	His	Ser	Ser	Asp	Ile	Ser	Val
	50						55					60			

Glu	Ala	Gln	Lys	Glu	Ser	Val	Ala	Arg	Gly	Pro	Val	Glu	Asn	Ile	Ser
65					70					75					80

Gln	Ser	Val	Ala	Gln	Pro	Ile	Arg	Arg	Arg	Trp	Val	Gln	Asp	Lys	Lys
				85					90					95	

Pro	Val	Thr	Tyr	Ser	Leu	Lys	Asp	Val	Ala	Ser	His	Asp	Met	Pro	Gln
			100					105					110		

Asp	Cys	Trp	Ile	Ile	Ile	Lys	Glu	Lys	Val	Tyr	Asp	Val	Ser	Thr	Phe
	115						120					125			

Ala	Glu	Gln	His	Pro	Gly	Gly	Thr	Val	Ile	Asn	Thr	Tyr	Phe	Gly	Arg
	130					135					140				

Asp	Ala	Thr	Asp	Val	Phe	Ser	Thr	Phe	His	Ala	Ser	Thr	Ser	Trp	Lys
145					150					155					160

Ile	Leu	Gln	Asn	Phe	Tyr	Ile	Gly	Asn	Leu	Val	Arg	Glu	Glu	Pro	Thr
			165						170					175	

Leu	Glu	Leu	Leu	Lys	Glu	Tyr	Arg	Glu	Leu	Arg	Ala	Leu	Phe	Leu	Arg
			180					185					190		

Glu	Gln	Leu	Phe	Lys	Ser	Ser	Lys	Ser	Tyr	Tyr	Leu	Phe	Lys	Thr	Leu
		195					200					205			

Ile	Asn	Val	Ser	Ile	Val	Ala	Thr	Ser	Ile	Ala	Ile	Ile	Ser	Leu	Tyr
	210					215					220				

Lys Ser Tyr Arg Ala Val Leu Leu Ser Ala Ser Leu Met Gly Leu Phe
 225 230 235 240
 Ile Gln Gln Cys Gly Trp Leu Ser His Asp Phe Leu His His Gln Val
 245 250 255
 Phe Glu Thr Arg Trp Leu Asn Asp Val Val Gly Tyr Val Val Gly Asn
 260 265 270
 Val Val Leu Gly Phe Ser Val Ser Trp Trp Lys Thr Lys His Asn Leu
 275 280 285
 His His Ala Ala Pro Asn Glu Cys Asp Gln Lys Tyr Thr Pro Ile Asp
 290 295 300
 Glu Asp Ile Asp Thr Leu Pro Ile Ile Ala Trp Ser Lys Asp Leu Leu
 305 310 315 320
 Ala Thr Val Glu Ser Lys Thr Met Leu Arg Val Leu Gln Tyr Gln His
 325 330 335
 Leu Phe Phe Leu Val Leu Leu Thr Phe Ala Arg Ala Ser Trp Leu Phe
 340 345 350
 Trp Ser Ala Ala Phe Thr Leu Arg Pro Glu Leu Thr Leu Gly Glu Lys
 355 360 365
 Leu Leu Glu Arg Gly Thr Met Ala Leu His Tyr Ile Trp Phe Asn Ser
 370 375 380
 Val Ala Phe Tyr Leu Leu Pro Gly Trp Lys Pro Val Val Trp Met Val
 385 390 395 400
 Val Ser Glu Leu Met Ser Gly Phe Leu Leu Gly Tyr Val Phe Val Leu
 405 410 415
 Ser His Asn Gly Met Glu Val Tyr Asn Thr Ser Lys Asp Phe Val Asn
 420 425 430
 Ala Gln Ile Ala Ser Thr Arg Asp Ile Lys Ala Gly Val Phe Asn Asp
 435 440 445
 Trp Phe Thr Gly Gly Leu Asn Arg Gln Ile Glu His His Leu Phe Pro
 450 455 460
 Thr Met Pro Arg His Asn Leu Asn Lys Ile Ser Pro His Val Glu Thr
 465 470 475 480
 Leu Cys Lys Lys His Gly Leu Val Tyr Glu Asp Val Ser Met Ala Ser
 485 490 495

20

Gly Thr Tyr Arg Val Leu Lys Thr Leu Lys Asp Val Ala Asp Ala Ala
500 505 510

Ser His Gln Gln Leu Ala Ala Ser
515 520